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**Whiting et al.**

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(54) **CONTINUOUSLY VARIABLE  
TRANSMISSION OR CLUTCH WITH  
ORTHO-PLANAR COMPLIANT  
MECHANISM**

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**267/161**

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See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

2,407,757	A *	9/1946	MacCallum	464/29
2,533,249	A *	12/1950	Henson, Jr.	367/183
3,575,342	A	4/1971	Puster	
3,577,184	A	5/1971	McNeel et al.	
3,602,490	A	8/1971	Mueller et al.	
3,742,441	A	6/1973	Riley	
3,786,688	A *	1/1974	Svenson	474/19

(Continued)

**FOREIGN PATENT DOCUMENTS**

JP 63-140152 A \* 6/1988 ..... 474/14

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(57) **ABSTRACT**

A continuously variable transmission or clutch device (10) includes at least one pulley (18) rotatable on a pivot (28) and having a pair of adjustable sheaves (30, 34) including a movable sheave (30) movable along the pivot. An ortho-planar compliant mechanism (14) is capable of elastic deformation and operatively coupled to the movable sheave to bias the movable sheave towards or away from the other sheave. The ortho-planar compliant mechanism includes a substantially flat configuration and is deflectable therefrom as the movable sheave moves. The ortho-planar compliant mechanism can include a center platform (38) disposed on the pivot and a plurality of arms (42) extending from the platform to distal ends (46) coupled to the movable sheave.

**21 Claims, 3 Drawing Sheets**

